

by a bolt, *b*, which is the spindle for the pulley *P*. A second bolt, *b'*, is provisory, as is also the surplus of the chain *O*. The chains are coupled by means of hooks and rings.

The manipulating gear is that part of the apparatus which serves to act on the controlling gear, by pulling on the transmitting chain, thus setting the brake in action or releasing it. It can be placed on the tender, or in the con-

ductor's car, or in both, or on several cars of a train. Its construction and operation will be understood from the engraving, fig. 4, and the following: The transmission chain passes between three pulleys, two of which, *p* and *p'*, are fixed, held in a cast-iron frame attached to the tender or car, and the third or middle pulley, *p''*, can slide up and down between guides, thus pulling on the chain or not. This middle pulley is held by a vertical rod, whose upper end is provided with a screw spindle, *K*, by means of which and of

a hand-wheel, *W W*, it can be raised or lowered. To make it possible to pull suddenly on the chain, however, when this may be required, the nut of the hand wheel is made in two parts, which can be separated instantly, and allow the spindle to fall down by itself, and thus apply the brake. This is accomplished by means of a handle, *N*, which the brakeman grasps with one hand, turning it suddenly to

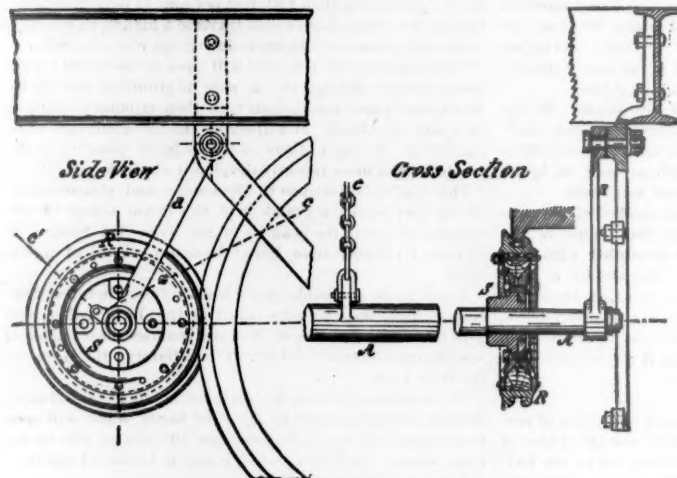


Fig. 1. FRICTION GEAR.

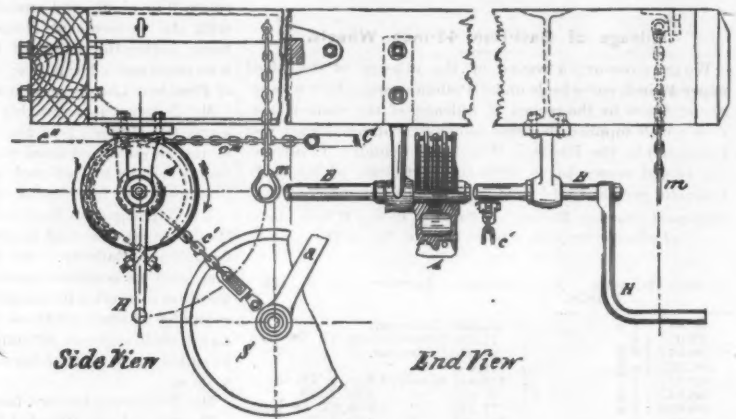


Fig. 2. CONTROLLING GEAR.

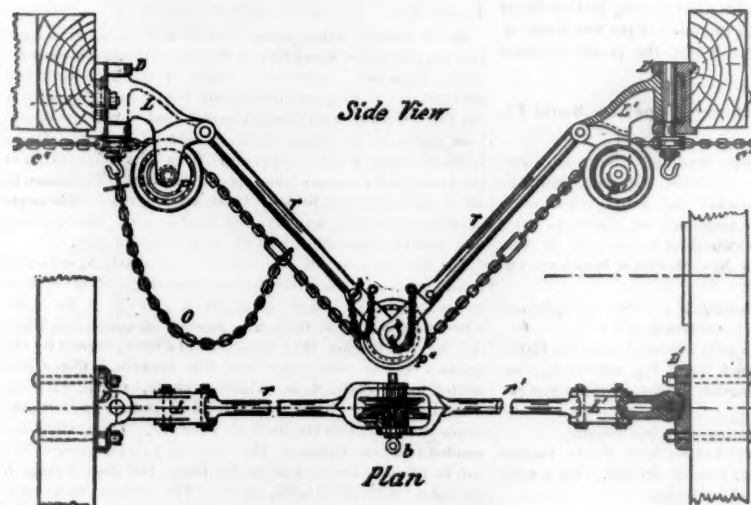


Fig. 3. COUPLING.

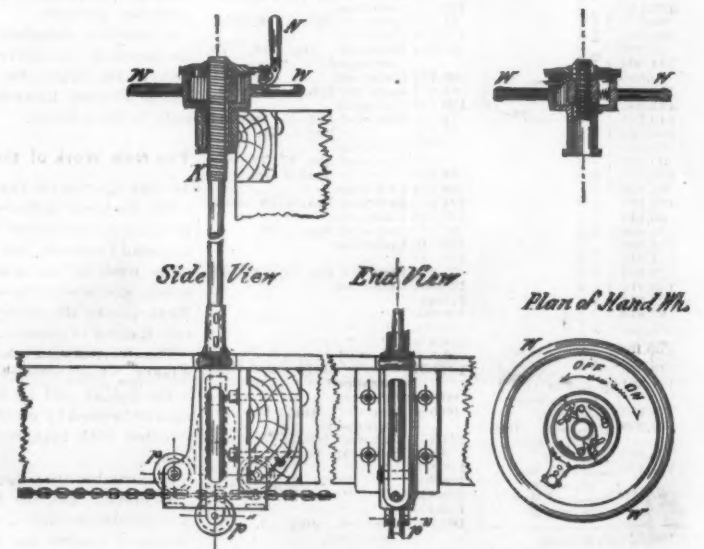


Fig. 4. MANIPULATING GEAR.

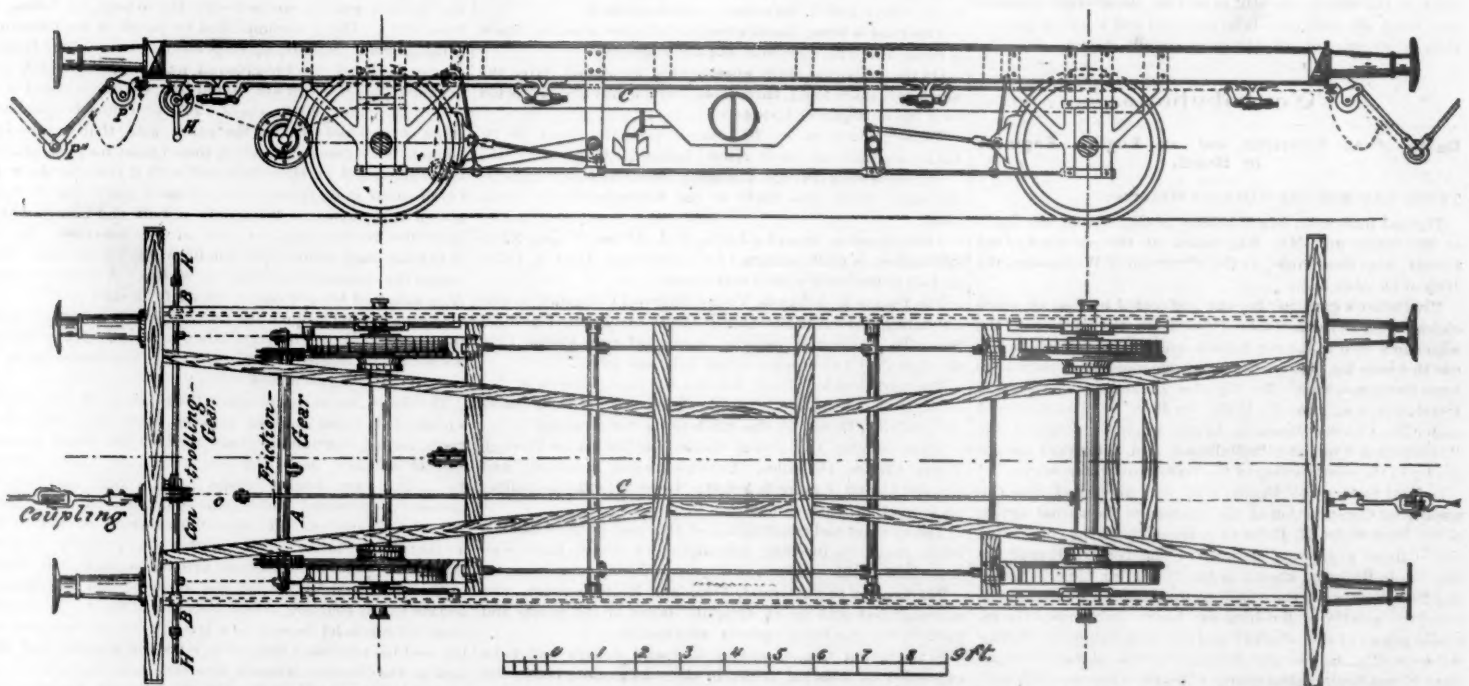


Fig. 5. BECKER'S AUTOMATIC FRICTION BRAKE APPLIED TO A PASSENGER CAR OF THE AUSTRIAN NORTHERN RAILROAD.

ductor's car, or in both, or on several cars of a train. Its construction and operation will be understood from the engraving, fig. 4, and the following: The transmission chain passes between three pulleys, two of which, *p* and *p'*, are fixed, held in a cast-iron frame attached to the tender or car, and the third or middle pulley, *p''*, can slide up and down between guides, thus pulling on the chain or not. This middle pulley is held by a vertical rod, whose upper end is provided with a screw spindle, *K*, by means of which and of

the right, while he holds the hand wheel stationary with the other hand.

In fig. 5 the arrangement of the Becker brake on a passenger car of the Austrian Northern Railroad is shown in side view and plan. The letters denoting its different parts correspond with those used in the description and illustration of its details.

This brake, as will now be understood from the above description, has several advantages of its own, due to its

principle and arrangement. It does not require any special apparatus to develop the motive power, but the accumulated momentum of the running vehicle is used for braking; it can be made continuous, or be arranged in groups of several cars, requiring then one manipulating gear and one brakeman for each group; it can be made for each car separately; it can be manipulated from the side (by means of

the handle *H*) on a single car, or on a group of cars, when switching; it brakes automatically the separated part of the train in case the train breaks in two; it will never admit of the wheels skidding, as the braking force is developed from the rotary movement of the wheels, and its action is thus most powerful in beginning (although it begins without the slightest jerk, as stated from observation) and gradually vanishes with the diminution of the speed of the vehicle; it is easy to manipulate and to keep in



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EDITORIAL ANNOUNCEMENTS.

Passes.—All persons connected with this paper are forbidden to ask for passes under any circumstances, and we will be thankful to have any act of the kind reported to this office.

Advertisements.—We wish it distinctly understood that we will entertain no proposition to publish anything in this journal for pay, EXCEPT IN THE ADVERTISING COLUMNS. We give in our editorial columns OUR OWN opinions, and those only, and in our news columns present only such matter as we consider interesting and important to our readers. Those who wish to recommend their inventions, machinery, supplies, financial schemes, etc., to our readers can do so fully in our advertising columns, but it is useless to ask us to recommend them editorially, either for money or in consideration of advertising patronage.

Contributions.—Subscribers and others will materially assist us in making our news accurate and complete if they will send us early information of events which take place under their observation, such as changes in railroad officers, organizations and changes of companies, the letting, progress and completion of contracts for new works or important improvements of old ones, experiments in the construction of roads and machinery and in their management, particulars as to the business of railroads, and suggestions as to its improvement. Discussions of subjects pertaining to ALL DEPARTMENTS of railroad business by men practically acquainted with them are especially desired. Officers will oblige us by forwarding early copies of notices of meetings, elections, appointments, and especially annual reports, some notice of all of which will be published.

A NEW PITTSBURGH RAILROAD.

Probably there are few places in the country whose traffic is of equal importance that have had less railroad competition for it than Pittsburgh. It has a truly enormous freight business—greater, probably than railroad men even, outside of that place, have any idea of. The materials which form that traffic are largely those substances which are nearly the cheapest of all property that is moved by rail, namely, coal and iron ore. Coal in Pittsburgh is cheaper than almost anywhere else in a manufacturing community, and this is well understood to be the basis of its great manufacturing industry. Coal and coke are brought to it (from mines at no great distance), as well as sent from it; it receives great quantities of iron ore from Lake Superior and elsewhere, and it ships vast quantities of the coarsest manufactures, such as pig and other iron, coarse glass, etc. A place manufacturing textile fabrics of high grade might readily produce several times as much value as Pittsburgh, and yet not afford a quarter of its traffic. Corn, the cheapest of Western freights, is now worth little more per pound in Chicago than pig iron in Pittsburgh; and the Chicago corn is worth six or seven times as much as the Pittsburgh coal. For manufactures like those of Pittsburgh cheap communications with its markets are of the first importance. A comparatively small addition to the freight rate adds a considerable percentage to the cost of pig iron sent from Pittsburgh to Chicago, and may easily double the cost of coal. There is scarcely any other business to which water communication is so advantageous.

Still Pittsburgh had its railroad outlets for many years pretty much all controlled by a single railroad company. It complained bitterly and urged and encouraged a new outlet to the East, which at length the Baltimore & Ohio provided through the Pittsburgh & Connellsville Railroad. But Pittsburgh seems never to have been satisfied with the result, complaining that the new road has been as bad as the old one. As the Baltimore & Ohio has never been able to get any-

thing like full interest on its investment in this road, however, it is not probable that its charges have been exorbitant. It is likely that, discovering on reaching Pittsburgh that anything less than the Pennsylvania Railroad's rates would not adequately support its own line, the Baltimore & Ohio was loath to make any reductions; and that being all that the new road was wanted for by many of the Pittsburgh people, they were greatly disappointed.

But the Pennsylvania has continued to control the rail business between Pittsburgh and the West, where is probably the chief market for Pittsburgh manufactures, and whence it receives great quantities of iron ore and large supplies of agricultural produce. This, considering the great number of railroads in Ohio, seems quite remarkable. At the time so many scores of railroads were built where there was no traffic to speak of, one would think that at least one would have been constructed from this place with so vast a traffic.

It must not be supposed, however, that because one company controlled nearly all the railroads to Pittsburgh it has been possible to exact any rates, however high. To this there have been several obstacles. One of these is the nature of the traffic itself. The same reason that makes the traffic large—the cheapness and coarseness of the freight—has also made it necessary that it should be carried at low rates. In the manufacture of cotton goods worth five cents a yard and 40 cents a pound, I may be able to compete with a rival who pays but 30 cents per hundred while I pay 50 cents. The difference is but one four-hundredth of a cent per yard after all. But with pig iron at \$16 a ton it is another thing. Twenty cents a hundred adds \$3.20 to the price. And with coal, five cents per 100 lbs. would add one-half to the price and make competition simply impossible. To get any business, therefore, the railroads have to make very low rates on many of the leading Pittsburgh freights. They are constantly tempted to make some reductions which will render it possible for a Pittsburgh manufacturer to get an order which otherwise would go to the works in St. Louis, Indianapolis or Milwaukee. People do not have to go to Pittsburgh for iron, glass and coal; they can get these things elsewhere, and they will get them elsewhere if the Pittsburgh wares are made dearer to them, whether by railroad freights or otherwise.

But Pittsburgh is further protected by its river outlet. It has been said, and there is some truth in the saying, that the Ohio River is frozen up half the year and dried up the greater part of the other half, but it is also true that in the comparatively short time that it is open it carries an enormous quantity of freight, and more from Pittsburgh, its very head, than from all other places combined. For instance, 2,500,000 tons of coal have been shipped by it from Pittsburgh in one year; pig iron, bar iron, rails, glass bottles, and the like, go on it in large quantities, in barges towed to any points on the Ohio or on the lower Mississippi and largely also to St. Louis. As the barge rates are extremely low—almost the lowest of all freight rates—it may be imagined what an effect they have on rail rates. Scarcely any coal goes by rail to points accessible to the river, and a great part of the other heavy freight makes little use of the railroads for distant markets. For instance, the great brewers of St. Louis gets barge-loads of bottles for their beer from Pittsburgh, and doubtless for something like half the actual cost by rail.

But in spite of this, the fact remains that the railroad traffic of Pittsburgh is very large and valuable. And it doubtless has been more valuable because of the extent to which it has been controlled by a single company than it would have been otherwise. For while Pittsburgh gets the advantage of low regular rates made to other places, it does not always get the advantage of low irregular rates. When cutting rates begins it is always at some place where two or more companies compete, and of course all parties try to prevent the extension of the cutting to the rest of their traffic. They cannot always prevent the reduction at one place where they compete having an effect at other places where they have a monopoly of the traffic, but they can often delay it and usually can make the reduction less there than at the competing point. So, though Pittsburgh may always have reasonable rates, it may not so often as most other places enjoy the unreasonably low rates with which railroad wars are fought. And whether rates are in themselves reasonable or not makes little difference to the producer who must compete with producers at other places which have lower rates. I am not entitled to have my freight carried for nothing; but still I may be ruined by having to pay less than the cost of carrying it if my competitor in business has his freight carried for nothing.

One reason why Pittsburgh business is exceptionally valuable to the railroads is because it affords an un-

usually large quantity of west-bound freight. With three cars out of four going west empty, it is apparent that additions of freight of this kind come to be looked upon as almost clear profit. When Mr. Shinn was General Freight Agent of the Pittsburgh, Fort Wayne & Chicago Railway, he made and published some very interesting studies of this subject, showing with what extremely low rates traffic of this kind could be made to add to the net profits of the road. And it is doubtless because there are so many empty cars going west all the time that this road and the Pittsburgh, Cincinnati & St. Louis make the low rates by which they are able to carry coal and coke great distances—to Chicago more than 200,000 tons of coal in one year. Trunk lines find additions of through west-bound traffic much more valuable to them than equal additions of east-bound. To carry an additional 400 tons of provisions or grain from Chicago to New York, they must provide an additional engine, 30 additional cars, and run an additional train some 1,900 miles—to New York and back to Chicago. But to take an additional 400 tons from New York or Buffalo or Pittsburgh to Chicago, not an engine nor a car need be added to the stock, not one additional train-mile or car-mile need be run. The terminal expenses connected with receiving and delivering freight and the cost of the small additional amount of fuel required to haul loaded instead of empty cars, are pretty much the only additions to the expenses. The west-bound traffic is, therefore, especially desirable, and it is easy to understand why a company should make special efforts to increase it on its own lines, either by developing new business or by diverting old business from other roads.

This makes it the more remarkable that hitherto the other trunk lines have made no serious effort to take from the Pennsylvania Company a share of the Pittsburgh traffic. That company works the lines to Erie and Cleveland, as well as those to Chicago, Cincinnati and the West generally, and controls the Allegheny Valley line, which connects Pittsburgh with the oil regions and with Buffalo. And this delay on the part of other roads is the more remarkable because the connection which is now made, and which gives two of the great carriers north of Pittsburgh a favorable route for traffic between Pittsburgh and the whole West, is obtained by constructing only 68 miles of road.

This little road, then, the Pittsburgh & Lake Erie, may be looked upon as an exceptionally important line, opening as it does a wholly new route from Pittsburgh to Ashtabula, Cleveland, Cincinnati, Chicago and the country beyond.

In many cases when roads like this are built, it is only with the hope of working in connection with the longer roads which it joins or crosses, and securing their active coöperation—a hope which often is not realized. One of the commonest arguments in favor of the future profitability of a railroad and the security of its bonds is the number of connections which it will make, though these connections are often with lines whose interests forbid their using the new road, or which may, and finally do, choose to make a combination with some other line in preference. But the Pittsburgh & Lake Erie had contracts with its important connections, the Lake Shore & Michigan Southern and the Atlantic & Great Western, before its construction was begun. Indeed, the new road probably was the fruit of that contract, and may properly be looked upon as a Pittsburgh Branch whose construction these companies have secured, though without any contribution to the cost or assumption of liability for the result.

This contract provides that traffic between Cleveland and Pittsburgh shall be carried over the leased Cleveland & Mahoning line of the Atlantic & Great Western, from Cleveland to Youngstown, which is the northwestern terminus of the Pittsburgh & Lake Erie, and thence to Pittsburgh over the 68 miles of the Pittsburgh & Lake Erie. This makes a Pittsburgh-Cleveland line 133 miles long, against 150 miles by the Pennsylvania's leased Cleveland & Pittsburgh Railroad. Ashtabula will be reached by a connection of the Pittsburgh & Lake Erie with the Mahoning Coal Branch of the Lake Shore & Michigan Southern, 62 miles long, making a line 190 miles long, against 125 miles by the Pennsylvania's line. The Lake Superior ore used at Pittsburgh comes chiefly by Cleveland, Ashtabula and Erie, the latter being 148 miles distant by the Pennsylvania's Erie & Pittsburgh road, against 171 by the Lake Shore and the new road.

Traffic from the Pittsburgh & Lake Erie bound eastward is to be turned over to the Lake Shore road at Youngstown. By this route the distance to New York will be nearly 700 miles, against 444 by the Pennsylvania. The distance to Boston, however, will be but 700 miles by the new line, against 875 by the Pennsylvania. If much east-bound business is done by the for-

mer, it is likely to be to New England rather than New York city.

Traffic to the west and northwest, including, we believe, all to the north of the Baltimore & Ohio's Chicago line, is to go to Cleveland and thence by the Lake Shore & Michigan Southern. The distance from Pittsburgh to Chicago by this line is 489 miles, against 469 by the Pittsburgh, Fort Wayne & Chicago. This will be a very favorable route, the difference in distance not being enough to prevent making equally good time, while important markets for Pittsburgh freights are directly on the Lake Shore's lines.

Traffic to points south and southwest of Cleveland—that is, everywhere south of the Lake Shore's territory—is to go to the Atlantic & Great Western. A great many important markets for Pittsburgh manufactures are in this district, but the distance is considerably greater by the Atlantic & Great Western than by the Pennsylvania line (to most places the Pittsburgh, Cincinnati & St. Louis). Thus the distances by the two routes are:

| Pittsburgh to | Penna. R. R. | A. & G. W. |
|-------------------|--------------|------------|
| Dayton..... | 264 | 308 |
| Columbus..... | 193 | 261 |
| Cincinnati..... | 313 | 367 |
| Indianapolis..... | 381 | 405 |

In the routes to Columbus and Indianapolis the Atlantic & Great Western forms comparatively a small part—about 150 miles.

Although the Pittsburgh traffic is so large, and although the new road and its connections will give it a new outlet to nearly the whole West, it will be easy to overestimate its effect in diverting traffic from the Pennsylvania's lines. One of the peculiarities of leading articles of Pittsburgh freight is that a very large proportion of it is and must be delivered or loaded on the premises of the consignee or shipper. Great iron works and the like have sidings laid down on their grounds, and the cost of carting half a mile even would often be fatal to the prosperity of the manufacturer. The consequence is that an old, established railroad like the Pennsylvania, constructed when the town was comparatively small and land cheap, has had an opportunity to put its tracks where they will best collect traffic, and has been compelled to establish what is equivalent to a score of stations. Now to reach Pittsburgh is one thing, and to reach these dozens of great factories so as to be of much use to them is a different and much more difficult thing. It is easy to see that with a station in a central position in Pittsburgh and the general good-will of the people, the new road may be able to get but a comparatively small share of some of the heaviest freights.

It is not, however, as if there had been a new road built from Pittsburgh to Chicago, such as the Baltimore & Ohio formerly intended to construct. It is a little line, only 68 miles long, with considerable local resources, and likely to have business enough at all events to support it fairly, especially as it will have two great railroads working to secure it traffic as if it were their own.

Formerly the opening of such a road would have been the signal for cutting rates. When a new rival entered the field the old line seemed inclined to show it that though it might get traffic it would get no profit. After bleeding to exhaustion the two would finally attempt to establish paying rates again, but frequently would find it impossible to keep them at the old figures after having reduced them so much. But recently there have been some cases where all parties seemed to recognize the fact that when a road is once built it will not be removed, however unprofitable the business may be, and that when traffic is divided there is all the more need of a profit on it. There has never been any cutting, we believe, between the old and the new lines from New York to Philadelphia. The two companies agreed upon a rate before the new road was opened. But it will count for something that the new road will make a railroad war more harmful than heretofore to the Pennsylvania interest. It, however, can hardly complain. It has sent lines northward until it taps nearly every important place on the feeders of the New York Central and the Erie—Buffalo, Erie, Ashtabula, Cleveland, Toledo, Kalamazoo and Grand Rapids. The Lake Shore in Pittsburgh may be regarded as a set-off for the Pennsylvania in Buffalo; though if the Lake Shore does not get more Pittsburgh traffic than the Pennsylvania does Buffalo traffic, the projectors of the new road will certainly be disappointed.

The New York Freight Apportionment.

A good deal has been said recently as to cutting rates on west-bound freight, and it has been charged that the apportionment is, and long has been, a sham. There has been enough truth in these statements to make some people believe the whole of them.

At various times since the agreement for the divi-

sion of New York freight went into effect on the 1st of July, 1877, efforts have been made by various western connections of the trunk lines to increase their proportions by offering rebates. In some cases the offending road has apparently acted in defiance of its trunk line connection, but in others it has seemed that there must have been connivance on the part of the trunk line. But though the efforts thus made have sometimes caused considerably more than its proportion to be offered to one or other of the trunk lines at the time, we believe that in no case have they carried the excess—that is, not in the long run. Transfers are not made as soon as an excess is shown, because the road which has too much this week may have too little next, and so the balance may be brought about without any handling.

During the whole time that the pool has been in operation, more than its proportion has been offered to the New York Central. It was anticipated that this might be the case for a few months, because it had contracted for an immense proportion of the freight during the year previous (the contracts expiring just as the pool went into effect), and the Pennsylvania had been substantially out of the market. But there continued to be an excess all last winter, though not so much as earlier, made greater than it would have been otherwise, doubtless, by the efforts of the Wabash to enlarge its business by rebates and the like.

Last May the New York Central gave notice that it should claim a revision of the contract and a larger share of the freight. Negotiations were begun, but, before any conclusion was arrived at, something (Mr. Garrett's absence, we believe) caused one of the parties to ask to have the matter postponed. It was urged then that while the temporary effect of the contracts of 1876 might have expired before last winter, the quantity offered the New York Central had been made considerably larger by the operations of the Wabash, and that therefore the winter's business was not a fair criterion of the natural division of the traffic among the several lines. This may also have been a reason for postponing a division. Everything was working smoothly at the time, and it may have been thought that the summer business would afford a fairer basis for a permanent division than any previous experience.

But this left great temptations to each road to make tremendous efforts to increase the proportion of freight offered it. A new division was demanded and was likely to be made, and if the New York Central was to get more each of the other three roads was anxious that what should be added should not be taken from its share. If meanwhile it could get more than its proportion offered to it, it could insist that its percentage should not be reduced. It did not matter that it would not be allowed to carry the additional one, two or three per cent. that might be offered it. It was the traffic of future years that it was working for, not the paltry tonnage of a month or two this year. It is believed that various illegitimate efforts were made to increase proportions, but the only one that seems to have had much effect, or has attracted much attention, was by connections of the Baltimore & Ohio Railroad. That road, by the old agreement, was given 9 per cent. of the New York shipments. It is said that for a long time after the division began it did not have nearly this amount offered it. But recently it has had a little more than its proportion. Being far behind, after it was known that its business was being increased by rebates, no complaint was made, it being tacitly understood that it might make up its proportion in that way if it preferred to accept less than full rates instead of full rates, as it would have its percentage in any event. At this time we believe it has a little more than made up its proportion.

On Thursday of this week there is to be a meeting of the parties to the apportionment contract, not particularly to deal with this matter of cutting rates, but to decide upon the percentages to be allotted hereafter—that is, to complete the business begun last May. The New York Central in consenting to a postponement required, we believe, that the award should cover the business back to the time of the postponement or the claim. We believe that in spite of the recent special efforts to divert traffic (few of which seem to have been in its favor), it has continued to have more than 33 per cent. of the freight offered it.

All the irregularities since the pool was formed, however, have had on the whole scarcely any influence on the aggregate receipts. The cuts themselves have been slight, because they have not been met, and a slight reduction was enough to effect the purpose aimed at. And most of them have had absolutely no influence on the amount of traffic carried on the several trunk lines—only on the amount offered them. Judging by the experience of recent years

as to what rates would have been without the combination, it must have been of enormous advantage, and that not to the trunk lines only, but also to all their Western connections which carry through freight—an advantage which could not possibly be balanced by an addition of several per cent. even in the proportion carried by a line.

Probably the result of Thursday's conference will become known to most of our readers by the time this reaches them.

New York Street Railroads.

The reports of the street railroads of New York city to the State Engineer have been looked for with some interest to see what effect the elevated roads may have had upon their business. Three of the principal companies have reported, two of which are directly affected by the west side elevated lines, while the third, the Third Avenue line, had to compete with the East Side Elevated road only about six weeks of the year covered by the report, which is that ending Sept. 30. Some figures from these reports are as follows:

| Broadway & Seventh Avenue: | 1877-78. | 1876-77. | Inc. or Dec. | P. C. |
|----------------------------|-------------|-------------|--------------|-------|
| Passengers carried..... | 18,452,557 | 19,438,335 | D. 985,778 | 4.9 |
| Gross earnings..... | \$943,630 | \$900,586 | D. \$43,044 | 4.7 |
| Net earnings..... | 369,030 | 346,497 | I. 22,533 | 6.5 |
| Eighth Avenue: | | | | |
| Passengers carried..... | 14,289,098 | 14,752,900 | D. 463,802 | 3.1 |
| Gross earnings..... | \$745,111 | \$767,479 | D. 22,368 | 2.9 |
| Net earnings..... | 167,171 | 183,780 | D. 16,618 | 9.0 |
| Third Avenue: | | | | |
| Passengers carried..... | 30,400,000 | 30,700,000 | D. 300,000 | 1.0 |
| Gross earnings..... | \$1,710,682 | \$1,730,456 | D. \$19,774 | 5.9 |
| Net earnings..... | 719,602 | 606,272 | I. 113,330 | 8.0 |

The Third Avenue receipts for 1876-77 above do not include \$88,000 for real estate sold, which was reported in that year.

The stockholders have not had much cause to complain as yet. The Broadway & Seventh Avenue Company, after paying \$119,000 interest and \$37,582.50 for new cars, divided \$199,500, being 9½ per cent. on its capital stock of \$3,100,000, the same dividend as for the previous year. The Eighth Avenue paid \$15,220 interest and \$20,000 in reduction of floating debt, and then divided \$120,000, or 12 per cent., on its \$1,000,000 stock. The Third Avenue paid \$140,000 interest and bought \$30,000 bonds, paying from the surplus \$500,000 dividends and \$100,000 "payment to stockholders under resolution of directors," which is in all \$600,000 on its \$2,000,000 capital stock, or 30 per cent.—a very fair dividend in these times.

Record of New Railroad Construction.

This number of the *Railroad Gazette* contains information of the laying of track on new railroads as follows:

Manchester & Keene.—Extended from Hancock, N. H., westward to Keene, 17 miles.

Flint & Pere Marquette.—Track has been laid on the Saginaw & Clare County Branch from Farwell, Mich., north 3 miles.

Mobile & Spring Hill.—Completed from Mobile, Ala., west to Spring Hill, 8 miles.

West End Narrow Gauge.—Extended from Normandy, Mo., northwest to Florissant, 10 miles. It is of 3 ft. gauge.

Republican Valley.—The first track is laid from Hastings, Neb., south by west to Red Cloud, 41 miles.

Kansas Pacific.—This company's Junction City & Fort Kearney line has been extended from Clifton, Kan., west to Clyde, 6 miles. Its Solomon road has been completed from Solomon, Kan., northwest to Minneapolis, 23 miles.

Utah & Northern.—Extended from Portneuf Cañon, Idaho, northward to Blackfoot, 71 miles. It is of 3-ft. gauge.

This is a total of 179 miles of new railroad, making 2,126 miles completed in the United States in 1878, against 1,964 miles reported for the corresponding period in 1877, 2,153 in 1876, 1,176 in 1875, 1,731 in 1874, 3,456 in 1873 and 6,559 in 1872.

THE UNPROFITABLENESS OF PASSENGER TRAFFIC has been the subject of much discussion in Germany recently. Formerly passenger traffic there was counted one of the chief resources of the railroads, and the change has been due not to a decrease in traffic, for it has increased, nor to a reduction of rates, for they have been very well maintained near the legal maximum; but to an increase in passenger expenses due to more frequent trains with fewer passengers, to greater speed, and the greater luxury in the appointments of railroad traveling—a course nearly parallel to that in this country, except that here there has hardly been as great an increase in traffic and a much greater increase in the elegance of cars. By the report of the Berlin & Creden Railroad for the year 1877 it appears that the average receipt per passenger per mile was but 1.75 cents, while the expense was 3.345 cents, or nearly twice as much! The receipt per ton per mile on the same road was 2.062 cents, and the expense 1.215 cents. Thus the profit of 0.847 cents per ton per mile (how rich our American companies would be if they could make such a profit!) goes largely to pay a loss of 1.595 cents per passenger per mile. On another German road (Halle, Sorau & Gruben), while there was a profit of 0.835 cent per ton per mile, there was a loss of 0.04 cent per passenger mile.

The remedy proposed in Germany is a reduction of passenger expenses, it being considered impossible to increase the rates. And the reductions in expenses may be effected, it is urged, in the following ways: By a limitation of the number of passenger trains; by putting mixed trains in the place of certain passenger trains; by using, especially for short runs

and light suburban traffic, a kind of steam car something like the steam street cars; and by a reduction of the number of classes of passengers. A recent proposition is to have three classes, distinguished as follows: First class, with cushioned seats; second class, with uncushioned seats; third class, with places for standing only.

THE PACKING SEASON has opened most promisingly, so far as the bulk of business is concerned. Though the summer packing was very much greater than ever before, and last winter the product was so enormous as to seem likely to glut the market and discourage production the next season, we have reported for the first 27 days of the current season, at the six leading packing cities, 1,285,000 hogs have been packed this year, against 890,000 in 1877, 763,000 in 1876, 775,000 in 1875, 1,090,000 in 1874, and 1,035,000 in 1873. Taking all the packing places together, it is estimated that 1,800,000 hogs were packed this year, against 1,000,000 last year. The packing of the six leading places in the Northwest and the percentage of each of the total packing of the Northwest are reported as follows:

| | No. of Hogs. | Per cent. | No. of Hogs. | Per cent. |
|-------------------|--------------|-----------|--------------|-----------|
| Chicago..... | 725,000 | 56.4 | 385,000 | 55.8 |
| Cincinnati..... | 170,000 | 13.2 | 100,000 | 14.5 |
| St. Louis..... | 115,000 | 9.0 | 55,000 | 8.0 |
| Milwaukee..... | 105,000 | 8.2 | 50,000 | 7.2 |
| Louisville..... | 85,000 | 6.6 | 65,000 | 9.4 |
| Indianapolis..... | 85,000 | 6.6 | 35,000 | 5.1 |

Six cities.....1,285,000 100.0 690,000 100.0
Chicago, thus, not only keeps its lead, but increases it somewhat, and no other place has packed one-fourth as many. The six places together gained 595,000 for the 27 days, and Chicago's gain meanwhile was 340,000. The weather was very unfavorable last year, and the great gain was made later in the season. The season cannot be said to have been favorable this year, not being cold enough. But it has been much better than November of last year, which was wet as well as warm. It is expected that December also will show a great gain over last year, but after that it is not probable that the gain will be so great. If it is, it is not easy to see what can be done with all the product. The importance of hog products as freight may be judged from the fact that the shipments of these products from Chicago during the first three weeks of November were 35,684 tons—enough to make nearly 2,000 old-fashioned car-loads every working day. St. Louis shipments for three days more time were but 3,953 tons, or 189 such car-loads daily. The exports for the first 23 days of November were 38,639 tons this year, against 22,401 last, the increase being 72½ per cent. Prices are so low that there seems to be no difficulty in finding a market for all the meat that is produced, though the farmers make great sacrifices. They get but about half as much for their hogs now as they did a year ago, and but about two-fifths of the price the two previous years. But heretofore hogs have been much more profitable than corn in the Northwest. Now the stock of hogs seems to have caught up with the corn production, so that, except at great distances from market, there is not much advantage in shipping hogs rather than corn. The former, however, are still worth about four times as much as corn per pound in Chicago.

THE TONNAGE OF VESSELS OF THE UNITED STATES as reported by the Secretary of the Treasury at the end of June last to have been 4,212,764, in 25,264 vessels, the average tonnage thus being 167 tons. Of the whole number 22,227, with 2,583,717 tons of the capacity—that is, 88 per cent. of the number, and 61 per cent. of the tonnage—was engaged in domestic commerce, and included many barges, a few canal-boats, etc. Vessels engaged on the interior waters of a state are not required to be enrolled and licensed by the Treasury Department. There was in the year an increase in the tonnage and number of vessels engaged in foreign trade, but a decrease in those engaged in domestic commerce. The average tonnage of the former at the end of the year was 536 tons. About 4½ per cent. of the total number of vessels were lost or abandoned during the year, and of these 3 per cent. (760) were lost at sea, which thus seems to be the usual death of a vessel.

The losses of the year were a little more than made up by the construction, and the decrease in aggregate tonnage is wholly due to sales to foreigners. And the tonnage of vessels built is a third greater than in the previous year. The new vessels, however, appear to have been mostly very little ones, having an average capacity of only 187 tons, which is less than that of the average Erie Canal boat. The vessels of different classes built during the year, their number, aggregate tonnage and average tonnage were:

| | Number. | Aggregate tonnage. | Average tonnage. |
|---------------------------|---------|--------------------|------------------|
| Sail vessels..... | 532 | 106,067 | 199 |
| Steam vessels..... | 334 | 81,860 | 275 |
| Enrolled canal-boats..... | 10 | 1,908 | 190 |
| Barges..... | 373 | 45,069 | 122 |
| Total..... | 1,258 | 235,504 | 187 |

It would thus appear that the new construction is mostly of very small craft. Altogether they have a tonnage equivalent to that of about 17,000 modern freight cars (14 tons per car), and the total domestic tonnage registered equals that of 184,551 such cars.

These figures would be much more valuable if they included the tonnage not registered, the amount of which we can only guess. Some idea of one class of the vessels may be had from the fact that the United States inspectors of steamboats inspected 4,137 steam vessels in the year, with an aggregate capacity of 1,017,432 tons.

THE PROSPERITY OF THE LAKE MARINE is a matter which greatly interests the railroad companies—Eastern and Western companies—though the Western companies' in-

terests are frequently opposed to those of the companies which connect them with the East. If the vessels have made tolerable profits at the rates of the past two or three years—profits enough to encourage the maintenance of the fleet by the construction of new vessels to take the place of the considerable tonnage that disappears every year—then there is little prospect that any considerable profit can be made by the railroads hereafter in carrying grain from the lake ports and other places in the same latitude to the seaboard. A short time ago we published a statement from a Detroit corporation interested in the lake business which indicated that, profitable or unprofitable, the lake tonnage is increased and not diminished during all this time of low rates, but that the increase is in large vessels and steam barges with tows, while the small vessels are growing fewer in number. This indicated that the lake tonnage would not under any probable circumstances be likely to decrease, and that its competition with the railroads would be at least as effective hereafter as heretofore.

But a vessel-owner writes to the Chicago *Inter-Ocean* to state the following propositions, which he says cannot be controverted:

"1. That under existing circumstances the carrying capacity by steam and sail is in excess of the demand; that only by a unity of interests can very many of the present ownerships be maintained, and a living return had from the investment. This is painfully demonstrated almost daily, so further comment is unnecessary.

"2. The increased facilities afforded by the great trunk lines being also in excess of the demand, ruinous wars for the supremacy was the result until absolute necessity compelled a return to reason, and a determination to demand adequate compensation."

He then urges the consideration of some plan for maintaining rates, and of a severer inspection, which would have the effect of reducing the tonnage offering.

LAKE NAVIGATION, it is said, is likely to continue later than usual, an unusual number of vessels at Chicago standing ready to start out with cargoes for Buffalo after November, tempted, doubtless, to encounter the risks by the (comparatively) high rate of 7 or 7½ cents a bushel, which is nearly twice as much as their average fall rate even this year, and four times as much as the July rate. Officers in charge of harbors have taken up the buoys and removed the lightships, but several vessels left Chicago on the 28th ult., and a schooner with capacity for 90,000 bushels of corn was chartered for Sarnia on the 29th, and on that day there were as many as 13 cargoes of grain on Lake Michigan on the way down, and others were loading, and still others offering. There is danger that the Straits of Mackinaw may close before all of these get through, but this will only necessitate the return of the vessels, and the lakes themselves will be open much of the time through the winter. Lumber vessels, therefore, can sail longer than the grain and ore vessels that have to pass through the Straits. There will hardly be any cessation of activity among those carrying to Chicago from Lake Michigan ports until after the middle of this month, and in every month of the winter some passages are likely to be made.

LAKE RATES have advanced from 6½ to 7½ cents per bushel for wheat from Chicago to Buffalo, with cargoes leaving nearly every day in the week when the weather permitted; but it is not probable that the shipments hereafter, if any, will include any considerable quantities.

There are no through canal rates. The few boats leaving Buffalo are for interior points. The canal is to be closed next Saturday. Railroad rates from Buffalo to New York since the canal shipments ceased are reported half a cent lower on wheat, and now stand at 7½ cents per bushel for wheat, 7 for corn and 5 cents for oats.

Ocean rates are, perhaps, a little lower. Quotations Tuesday, by steam to Liverpool, were 7d. per bushel (56 lbs.) for corn; 2s. 9d. to 3s. per barrel for flour, 35s. to 37s. 6d. per ton for provisions, 47s. 6d. per ton for butter and cheese; ¼d. per pound for cotton. To Cork for ordure, to Bordeaux and to Havre, charters of sailing vessels are reported at 5s. 3d., 5s. 6d. and 5s. 9d. per quarter for grain. Contracts for cotton to Liverpool from New Orleans are reported at 13-32d. to 7-16d. per pound, chiefly 7-16d., against ¼d. from New York.

THE RAILROAD MAIL SERVICE at the end of last June, extended over 77,119 miles of railroad routes, according to the report of the Superintendent of that service. The miles of railroad over which the service extended were probably somewhat less, as there are many cases where different railroads use the same track for a longer or shorter distance. According to Poor's Manual, the mileage of railroads in operation in the United States six months previously was 79,208, and some 500 miles more had been opened by July. If these figures are correct, it would indicate that there were last July at least 2,600 miles of railroad on which there was no mail service, which seems extremely improbable. Usually one of the first things a new railroad is called upon to do is to carry the mails. On 16,980 miles of the routes, post-office cars were run, whose service amounted to 17,933,910 miles during the year, out of a total of 92,120,325 miles in the whole railroad service. On the whole system of 77,119 miles there was a service equivalent on the average to 1.8 mails each way daily for 313 days of the year; the post-office car service was equivalent to 1.69 runs daily each way on the lines on which such service was had.

THE OFFICIAL RAILWAY GUIDE, which has very nearly all the passenger time-tables of American railroads sent it, reports that for the twelve months ending with its December issue, it received an average of 158 new time-tables monthly, and in one month the number was 310. This not only illus-

trates the difficulty of making a railroad guide complete and accurate, but also the vast extent of the American railroad system. The December number of the *Official Guide* has time-tables for about 660 different roads. A number of the guide now has more than twice as many pages as *Harper's Monthly*. The pages are very large, too, and the printed surface is equivalent to about a thousand duodecimo volumes, and to nearly 700 pages of guides of the old shape, like the English Bradshaw and Appleton's. The *Official*, by the way, is very carefully edited, and generally has the coöperation of the railroad companies, though occasionally there is a new line which does not seem to find out that there is such a publication until it has been in operation for a year or two or more.

THE EAST-BOUND COMBINATION evidently was not begun early enough. The complaints that freight slips by some places and of discriminations against this and that city indicate very clearly that some of the places are living up to their agreement and that-cutting is going on somewhere. That any of the pooling points are cutting we do not hear, and there are plenty of loop-holes for freight to slip by them, and will be until pools are made at several more places. The expressions of the railroad companies interested are uniformly in favor of the scheme, but that does not set it into operation. Terre Haute has been added to the number of pooling points during the past week, but more than one a week is needed if the scheme is to be perfected in time to protect the winter traffic. It ought to have been completed before navigation closed, but there is still time. Matters are in a delicate condition, however, and unless something is done soon it is to be feared that we will have last winter's experience over again—plenty of traffic and no money.

EDITORIAL LETTERS.

VI.

BLOOMINGTON, ILL.

After the manner of the old geographies, it might be said by a railroad man that Bloomington is noted for being the locality of the Chicago & Alton Railroad shops. These were fully described in the *Railroad Gazette* some years ago. Until recently the locomotive and car departments on this road were independent of each other, the first being under the superintendence of Mr. Jackman, the Master Mechanic, and the latter under Mr. Reniff, the Master Car-Builder. Recently the two have been consolidated, and Mr. Jackman has been placed in charge of both. A son of Mr. Reniff, the former Master Car-Builder, is, however, still foreman of the car shops.

One of the first things which attracted attention here was a novel hand-car intended for the use of the men who have charge of the repairs of the telegraph. The idea of a velocipede to run on a railroad has occurred to a great many persons, but the difficulty exists of maintaining an upright position with a bicycle on the inflexibly straight or curved line on which the rails of a railroad are laid. This difficulty has been overcome by arranging the two supporting wheels to run on one rail, the rider sitting astride the vehicle as on an ordinary velocipede, immediately over one of the rails. From this portion of the vehicle a horizontal arm is attached which resembles somewhat the finger-bar of a reaping or mowing machine. This bar extends across the track to the opposite rail, on which a third wheel runs which supports the end of the transverse bar and thus steadies the machine. It is driven by levers and cranks worked by the hands and arms, and also by treadles operated with the feet of the operator. The car is extremely light and can be worked easily by one person on a level track.

We hope to give engravings of this car with fuller description soon. It is the invention of, and was built by, parties in Michigan.

Another novelty at the car-shops is a four-wheeled coal-car, which has just been completed. The body is 20 ft. long over the ends of the sills, and 8 ft. 4 in. wide, with sides 30 in. high. The wheels are 33 in. in diameter, and spread 10 ft. from centre to centre. The axles have collarless journals, the latter being 4½ in. in diameter by 8 in. long, with Bissell's stop-wedge bearing. The diameter of axle in wheel-seat is 5½ in. Those who think the Master Car-Builders' standard axle too large, will please note the above sizes. The weight and capacity of the car, as given last week, are: the former, 10,650 lbs. and the latter 28,000 lbs.

Mr. Jackman is now using copper for the sides of fire-boxes instead of steel, on account of the frequent cracking of the latter material. The back, crown and flue plates, and the whole outside shell of boilers, and also the tender tanks, he is making of steel. Steel for the outside shells of boilers is coming into general use in nearly all the Western railroad shops. Whether it will be more or less liable to corrosion, which is the insidious enemy of Western locomotive boilers, it is still too early to know.

Mr. Jackman is using the Master Car-Builders' standard axle for passenger cars, but for freight and tender axles he uses one which differs from that standard only in having a journal 6 in. instead of 7 in. long. He has, however, made a great many experiments on the strength of journals, which any one can repeat, and which if supported by the experience of others will indicate the necessity for increasing the strength of axles either by using a larger size or better material, or both. The experiments consisted simply in striking a hard blow with a heavy sledge on the outer end of a journal. Mr. Jackman says that a large proportion of the smaller-sized journals can be broken off with one such blow after the axle has been in use a few years. If this fact is sustained by common experience, it indicates a fatal deficiency in the strength of these parts of railroad cars.

At present no new work is in progress at the Bloomington shops, but it is expected that some new cars will be commenced early next year. About 125 new wheels are made per week in the foundry, for repairs.

A noticeable feature on the day trains on the Chicago & Alton road is the running of an unusually good class of cars, with a porter to look after the comfort of passengers. They are kept scrupulously clean, a duty which some railroad companies seem to have fallen into a habit of thinking has been delegated to the Pullman Car Company, and from which they are thus absolved. The cars of the Chicago & Alton road are provided with a wash-room, a luxury which costs so little that every railroad company should be able to supply it. It must be admitted, though, that in any attempt at keeping its cars decent and clean railroad officers encounter many discouragements and difficulties. There are, it must be confessed, many men and some women who do not seem to value cleanliness, and it is not unusual to find those who seem to prefer filth rather than decency. The common practice of running drawing-room, or reclining-chair cars, indicates clearly a tendency toward a division of travelers into first and second classes, although thus far this division is designated by some other name in deference to our democratic ideas. The end to be accomplished is the separation of the washed from the unwashed. The present parlor cars are arranged with one arm-chair to occupy the space of an ordinary double seat. For this reason the charge in these cars must be higher than many travelers can afford to pay. If, instead of these, a superior grade of cars, like those on the Chicago & Alton road, were run, and reserved seats sold at about half the usual charge for parlor cars, it would serve to supply a want which is now manifesting itself.

SPRINGFIELD, ILL.

The points of interest here to railroad men are the locomotive shops of the Wabash Railway, which are kept in admirable order by Mr. Johann, the Master of Machinery. He has 89 engines under his charge, which furnish the motive power for 440½ miles of road.

The evil of the diversity or want of uniformity in the construction of rolling stock and equipment was very strikingly illustrated on the Wabash road when Mr. Johann was placed in charge, probably not from any fault of his predecessor, but because those higher in authority paid no heed to such matters. The engines, as usually happens on new lines, were bought from different makers, and there were on the road 26 different kinds of driving-wheel springs, 15 kinds of cross-heads, 13 of driving-boxes, 17 sizes of pilots, 8 grate bars, 8 tender trucks, 6 engine trucks, 6 check valves and 3 sizes of tender hose. These Mr. Johann has systematized in the ordinary course of repairs, so that now he has only two kinds of driving springs, three cross-heads, three driving boxes, two pilots, one grate-bar, one tender truck, one engine truck, one check valve and one size of tender hose. The evil resulting from the great diversity in the sizes and patterns of these parts and the saving which would result from the use of uniform patterns no one without practical knowledge of the subject can know. Discussion of the subject has, however, attracted attention to the desirableness of uniformity, and there is an evident disposition to adopt and conform to some system which will secure the much-desired and much-needed end.

Mr. Johann has given the subject of boiler construction a good deal of attention, and has made a design which he proposes to use in rebuilding some of his superannuated engines. The outside shell is straight on top and 52 in. in diameter. The crown-sheet is arched transversely and is stayed to the outer shell by stay-bolts, and without crown-bars. The arching of the crown-sheet permits the stay-bolts to be placed very nearly at right angles to the inner and outer plates, and thus in great measure obviates one of the objections to the use of stay-bolts for this purpose and to this method of staying boilers. The crown-sheet is inclined downward from the flue-sheet, so that in case of low water the front end only is exposed to the fire—a plan that cannot be too highly recommended. The end plates are to be stayed with "gusset" stays or braces, made of plate iron, and attached with angle iron to the heads and to the outside shell of the boiler. The latter will have 162 2-in. tubes 11 ft. 6 in. long.

| | |
|---------------------------|--------------|
| The grate surface is..... | 16.4 sq. ft. |
| " fire box "..... | 107.1 " |
| " flue "..... | 975 " |

The total heating surface is..... 1,082.1 sq. ft.
The boiler will be all steel.

A novel arrangement is used for washing out boilers. It consists of a tube placed transversely in the under side of the boiler with nozzles directed backward, through which a stream of water is forced by a force-pump, which is used for a fire engine about the shops.

Among the various locomotives on this road is one of Mr. Wm. Mason's double-truck engines with a single boiler. It has four driving-wheels and a six-wheeled truck under the tank. This engine seems to have been without friends on the road after it was received. It was used for a short time, and then laid up for a year or two and regarded as a failure. Mr. Johann, however, overhauled it and put it to work. Some trouble was found with the joints in the steam and exhaust pipes. These were altered and the engine put to work on the road. The engine then hauled from four to six cars more than the ordinary eight-wheeled engine. The weight on the driving-wheels is 56,000 lbs., or 14,000 lbs. per wheel, which is excessive; but with a six-wheeled driving truck the evil of this would be obviated. After working a short time on the road it was put at work switching in the East

St. Louis yard, where it had been for two years until recently it was taken into the shop again for repairs.

The works of the Springfield Iron Company are located in the suburbs of the city. The products of this establishment have heretofore been iron rails, fish-plates and bolts. The rails have been manufactured chiefly from old rails re-rolled. These are re-heated in Siemens-Martin gas furnaces, a process which was first applied to the manufacture of iron in this country in this establishment. The old mill, which has been in operation for a number of years, approximates to an L shape and is 300 x 250 x about 75 feet. This mill has 16 gas producers, with heating furnaces, rolls and other machinery of a complete rolling mill. Every labor-saving appliance which diminishes the cost of production has been adopted. Some of these are very interesting to a person not familiar with rolling-mill machinery. One of these, the "Maharg charger," for putting the piles of scrap iron into the furnace, may be described as an enormous shovel, similar to those used by our grandmothers in charging their old-fashioned bake ovens with bread. The piles of scrap to be handled are so heavy that the work was formerly very severe. With the new appliance it is handled as it were by sleight of hand.

A great deal of severe work was formerly expended in withdrawing the heated mass of iron from the furnaces. This is now done by a steam "pull-out," which is simply steam power exerted on the end of a chain, which is harnessed to the mass of iron by suitable tongs and pulleys.

This mill has recently been employed in re-rolling the lighter patterns (about 40 lbs. per yard) of rails, which are now made in double the ordinary lengths. In October about 3,500 tons of such rails were re-rolled.

In a separate building is the machine shop, which is fully equipped with all the necessary machinery for turning rolls and repairing the machinery of the mill. A part of the building is employed as a bolt and nut shop, where the bolts and nuts are made and cut.

This company is now erecting the plant for manufacturing steel rails and plates. The process to be employed is that known as the Siemens-Martin. The furnaces which are to be erected will have Pernot's revolving bottom, which could not be described without illustrations and more space than can be given to it here.

A new bar mill has just been completed, which is intended to be worked on either steel or iron bars. The building is 106 x 295 ft., and has two trains of rolls, one 12 in. and the other 16 in., with three Siemens heating furnaces. This mill is intended to be employed in manufacturing bars and fish-plates, and is equipped with suitable machinery for cutting and punching the latter.

Near the last-named building is the new steel-melting house, which is 90 x 137 ft., and in which the Pernot Siemens-Martin furnaces will be erected. Opposite this is the new blooming mill, 100 x 200 ft. This building is not yet finished. It will be occupied by blooming mills and as a plate mill.

The new plant for the manufacture of steel was designed by Mr. Alexander L. Holley, and its erection is under the superintendence of Mr. Phineas Barnes, who intend that it shall have all the latest improvements known in the manufacture of steel.

This establishment is very favorably located for manufacturing at a low cost. The coal used is taken out from a mine on the premises, and Springfield is within easy shipping distance, and with abundant facilities for reaching the Lake Superior iron regions at the north, the Iron Mountain region in Missouri or the mines of Alabama and Tennessee at the south, and withal it is in the centre of the most fertile part of the Great West and in the focus, as it were, of its immense railroad system.

ST. LOUIS.

One of the first things which comes to the notice of a visitor to St. Louis, if he is interested in railroads, is that a very fierce competition is waging between different lines. The principal ticket offices are nearly all clustered around, or near, the Planters' Hotel, and here placards are displayed, announcing \$10 to New York and similar low rates to other points. Another significant sign which is seen here, and at other places in the West, is "— & —, Ticket Brokers," a business which the quarrels of the railroads have the tendency to develop into a permanent and regular occupation.

An apparent peculiarity about the railroad traffic of St. Louis is that nearly all the trains on the different roads terminating there seem to leave about the same hour in the evening and in the morning, and as they all leave from the Union Depot, that place becomes the scene of a good deal of life and activity. The arrangement of the depot, of which we published plans some time ago, is a little peculiar. The main building is long and comparatively narrow. The tracks extend alongside the building and parallel to it. From about the centre of the building a transverse covered way extends across the tracks. The trains are made up so that the ordinary cars are on one side of this way and the sleeping cars on the other. With half a dozen or more trains made up here and each receiving its passengers, it is a sight which any one will remember. Although the arrangement is in many ways very convenient, it has the one objection that in backing up the front part of the train to couple on to the sleeping cars, the passengers between are exposed to a good deal of danger, and it is only by the greatest watchfulness that accidents can be avoided.

At the shops of the Iron Mountain road, at Carondelet (now South St. Louis), there is not much to note. The rolling stock of this line has been worked to its full capacity, and the men are kept busy on repairs. The new shops at De Soto are not yet stocked with machinery, and, therefore, all the work for the northern portion of the line is done at

Carondelet. There is not much that is new to report of them. Mr. Haynes is using a new apparatus for oiling locomotive-cylinders, which we will illustrate soon, and therefore defer description. Wrought-iron brake shoes are used almost exclusively on this road, and are forged under dies on a steam hammer. The opinions of master mechanics are curiously vague on this subject of brake shoes. Some of them assert that wrought shoes will not hold as well as cast-iron, that they flatten the wheels, and that they become hardened by the friction on the latter. Others say that they can see no difference in the holding power of cast and wrought iron, that the latter does not flatten wheels more than the former, and that the hardening of the shoe by friction is a myth. Surely all these questions are capable of conclusive test, and need not be the subject of that very vague mental process which at conventions is called "my experience." The facts relating to different kinds of brake shoes are worth knowing, and could be clearly established by a little intelligent experiment. In some future mechanical millennial period railroad companies will doubtless learn that it would be true economy to cooperate and refer all such questions to the ablest specialists for investigation and experiment, and that it will be profitable to be liberal in expending money for such purposes.

At the Western Iron Boat-Building Company's yard at Carondelet there is a good deal of activity. The company has contracts for and has now in progress three iron survey boats for the United States officers. One of these has been launched. They are 55 ft. long by 10 ft. beam, with side wheels 9 ft. 3 in. in diameter, with double oscillating cylinder engines, the cylinders being 12 x 20 in. The boilers are of the locomotive pattern. The boats will draw 18 in. water.

There is also in progress at this yard an enormous iron snag boat, which is to be 190 ft. long x 62 ft. beam. It is an immense flat-bottomed affair, with what might be called a bifurcated bow—that is, the bow is divided longitudinally by an opening in the centre 8 ft. wide and 64 ft. long, giving the front of the vessel a forked shape. It is intended to run the boat so as to get the snags to be removed into this opening, when they will be raised up by suitable derricks, and then cut to pieces by saws driven by an engine. This boat is to have side wheels.

Contracts have also been made for the construction of two other smaller snag boats, 170 ft. long, with stern wheels, but work on these has not yet been commenced.

This establishment is under the charge of Mr. Theodore Allen, formerly of New York.

It is not generally known that the article, "Are Narrow-Gauge Roads Economical?" which was published in the December number of *Scribner's Monthly*, was written by Mr. L. M. Johnson, the General Manager of the Cairo & St. Louis narrow-gauge road. Compared with an extravagant article in favor of narrow-gauge, published in a preceding number of the same periodical, the last article is refreshing in its clear and very temperate statement of facts, whereas the first was a mass of extravagant assertions and the grossest misrepresentations. The following conclusions of Mr. Johnson might afford a suitable subject for discussion at the next narrow-gauge convention. He says:

"Let any man who is seeking for investment of capital in railway construction consult those who have operated both classes of roads, and he will be advised, almost invariably that he will save very little in cost of construction, equipment and operation, and that he will lose business from competition if he adopts the narrow gauge. My experience in the management of both classes of roads does not, therefore, lead me to conclude that the multiplication of narrow-gauge roads will cheapen transportation until the standard-gauge roads are suppressed, and even then the saving will be very much less than is usually claimed."

The cost of transfer of freight from the narrow to the wide-gauge cars is stated by Mr. Johnson to be on his road 3 cents per 100 lbs., or \$4.80 per car-load of 16,000 lbs. The box-cars weigh 10,500 lbs., and carry 16,000 to 17,000 lbs. of load, a proportion of a little over 1½ to 1, which is slightly exceeded by the carrying capacity of the cars on the Chicago, Burlington & Quincy Railroad. It should be stated, though, that the above cost of transfer includes a short haul on wagons, and that if the cars were placed side by side, the cost would be diminished perhaps one-half. Even this would be equal to 80 cents per ton, which on an ordinary railroad represents the cost of carrying that quantity of freight 60 miles.

But this is not all of the evil. Mr. Johnson says that people will nearly always give the preference to a line on which there is no trans-shipment, which makes it necessary at competing points either to give lower rates or lose the freight.

NEW PUBLICATIONS.

A History of the Growth of the Steam Engine. By Robert H. Thurston, A.M., C.E. New York: D. Appleton & Co. 12mo, pp. xviii, 490.

In this work the most important notes relating to the conception and development of the steam engine are collected and carefully arranged, leading the reader from the *Period of Speculation*, in which the power of steam was recognized, to the *Period of Application*, made notable by the achievements of the Marquis of Worcester, Savery, Papin and other well-known inventors. The work then treats of the *Development of the Modern Type of Steam Engine* by Newcomen and his co-laborers, leading naturally to the *Development of the Modern Steam Engine*, by Watt and his contemporaries. The *Second Period of Application* to *Steam Locomotives and Ship-Propulsion* is then considered, leaving the steam-engine waiting for the *Period of Refinement*, which has produced the prime movers in use at the present time. The developments of the different periods are

